

# Chapter 1 – Introduction

*Electricity is the power that causes all natural phenomena not known to be caused by something else.*

– Ambrose Bierce quotes  
American Writer, Journalist and Editor, 1842-1914

## 1.1 Background

The Maryland Department of Natural Resources (DNR) Power Plant Research Program (PPRP) evaluates how the design, construction, and operation of power plants and transmission lines impact Maryland's environmental, socioeconomic, and cultural resources. PPRP's legislative mandate calls for the program to explore and clarify these issues, seeking to ensure that the citizens of Maryland can continue to enjoy reliable electricity supplies at a reasonable cost while minimizing impacts to Maryland's resources. The program also plays a key role in the licensing process for power plants and transmission lines by coordinating the State agencies' review of new or modified facilities and developing recommendations for license conditions.

PPRP is directed by the Maryland Power Plant Research Act (§3-304 of the Natural Resources Article of the Annotated Code of Maryland) to prepare a biennial Cumulative Environmental Impact Report (CEIR). The intent of the CEIR is to assemble and summarize information regarding the impacts of electric power generation and transmission on Maryland's natural resources, cultural foundation, and economic situation.

This fifteenth edition of CEIR (CEIR-15) published by PPRP is subdivided into chapters that provide analyses of cumulative resource impacts and topical discussions of current trends. Chapter 2 reviews power generation, transmission, and usage. Chapter 3 discusses the issues and effects of power generation and transmission on Maryland's air, water, land, and socioeconomics. Lastly, Chapter 4 provides information on evolving policy and technical issues, such as Maryland's involvement in the Regional Greenhouse Gas Initiative (RGGI), carbon dioxide (CO<sub>2</sub>) reduction strategies, and related federal initiatives.

### 1.1.1 Legislative Mandate

The Maryland legislature passed the Power Plant Siting Act in 1971 as a result of extensive public debate over the potential effects of the Calvert Cliffs Nuclear Power Plant, which was in the approval and design stage, and the legislature's desire that the State of Maryland play a significant role in the decision-making process. At that time, Calvert Cliffs Units 1 and 2 were a source of concern because of the plant's once-through cooling system that withdraws 3.5 billion gallons of water per day from the Bay and then discharges it back into the Bay with an approximate increase in temperature of 12°F. This and other issues prompted the creation of PPRP to ensure a comprehensive, objective evaluation based on sound science to resolve environmental and economic issues before decisions were made regarding whether or not and where to build additional power generating facilities.

Today, PPRP continues this role by coordinating the comprehensive review of proposals for the construction or modification of power generation and transmission facilities and by

developing technically based licensing recommendations. Consistent with the original statute, PPRP also conducts research on power plant impacts to Maryland's natural resources, including the Chesapeake Bay. In addition to surface water concerns, PPRP evaluates impacts to Maryland's ground water, air, land, and socioeconomics for all proposed power facilities and transmission lines, either new installations or modifications to existing structures. Research into the beneficial use of coal combustion by-products (CCBs) is also included in this evaluation.

### ***1.1.2 Power Plant Licensing***

The Maryland Public Service Commission (PSC) is the regulating entity for power plants and overhead transmission lines greater than 69 kilovolts (kV) within the state.<sup>1</sup> The PSC is an independent commission created by the state legislature with commissioners appointed by the Governor for set terms.

An electric company that is planning to construct or modify a generating facility or a transmission line must receive a Certificate of Public Convenience and Necessity (CPCN) from the PSC prior to the start of construction. The approved CPCN constitutes permission to construct the facility and incorporates several, but not all, required permits, such as air quality and water appropriation (see Appendix A). Applications for a CPCN are reviewed before a Hearing Examiner in a formal adjudicatory process that includes written and oral testimony, cross examination, and the opportunity for full public participation. Parties to a case include the applicant, the PSC Staff, and the Office of People's Counsel (acting on behalf of the Maryland ratepayers), and interveners such as PPRP (acting on behalf of DNR and the other State agencies). Other groups, such as federal agencies and private environmental organizations, as well as individuals, also have a right to participate as interveners in these hearings. The broad authority of the PSC allows for the comprehensive review of all pertinent issues and was designed in 1971 to be a "one-stop shop" for power plant licensing.

The CPCN licensing process provides an opportunity for the State to examine all of the significant aspects and impacts of a proposed power facility, including the cumulative effects of interrelations between various impacts. This is a unique process within the State's regulatory framework. The CPCN mechanism recognizes the fact that electricity is a vital public need, but its generation and transport can produce impacts to the state's natural, social, and cultural resources. A distinguishing feature of PPRP's intervener status in the CPCN process is the high degree of interagency coordination involved. PPRP coordinates the project review and consolidates comments from the Departments of Natural Resources, Environment, Agriculture, Business and Economic Development, Planning, and Transportation, and the Maryland Energy Administration. PPRP then develops a set of consolidated and unique, scientifically supported, recommended licensing conditions for the CPCN to the PSC on behalf of the State agencies. In many instances, these conditions go beyond regulatory requirements to incorporate creative measures for mitigating potential facility impacts, often as stipulations agreed to by the applicant and other parties to the case prior to adjudicatory hearings.

If multiple facilities are located in close proximity, or are proposed in close proximity to each other or to existing plants, PPRP includes cumulative impacts within the consolidated review process. In such a case, impacts to air, water, terrestrial, land use, and other resources would be evaluated and compared to any identified thresholds of acceptability.

<sup>1</sup> There are certain exceptions where a CPCN is not required, such as for land-based wind power projects no greater than 70 MW; generators no greater than 70 MW that produce on-site electricity with less than 20 percent of that electricity being exported or sold on the wholesale market; and generators with capacity no greater than 25 MW that consume at least 10 percent of the electricity generated on-site (see PUC Article § 7-207.1).

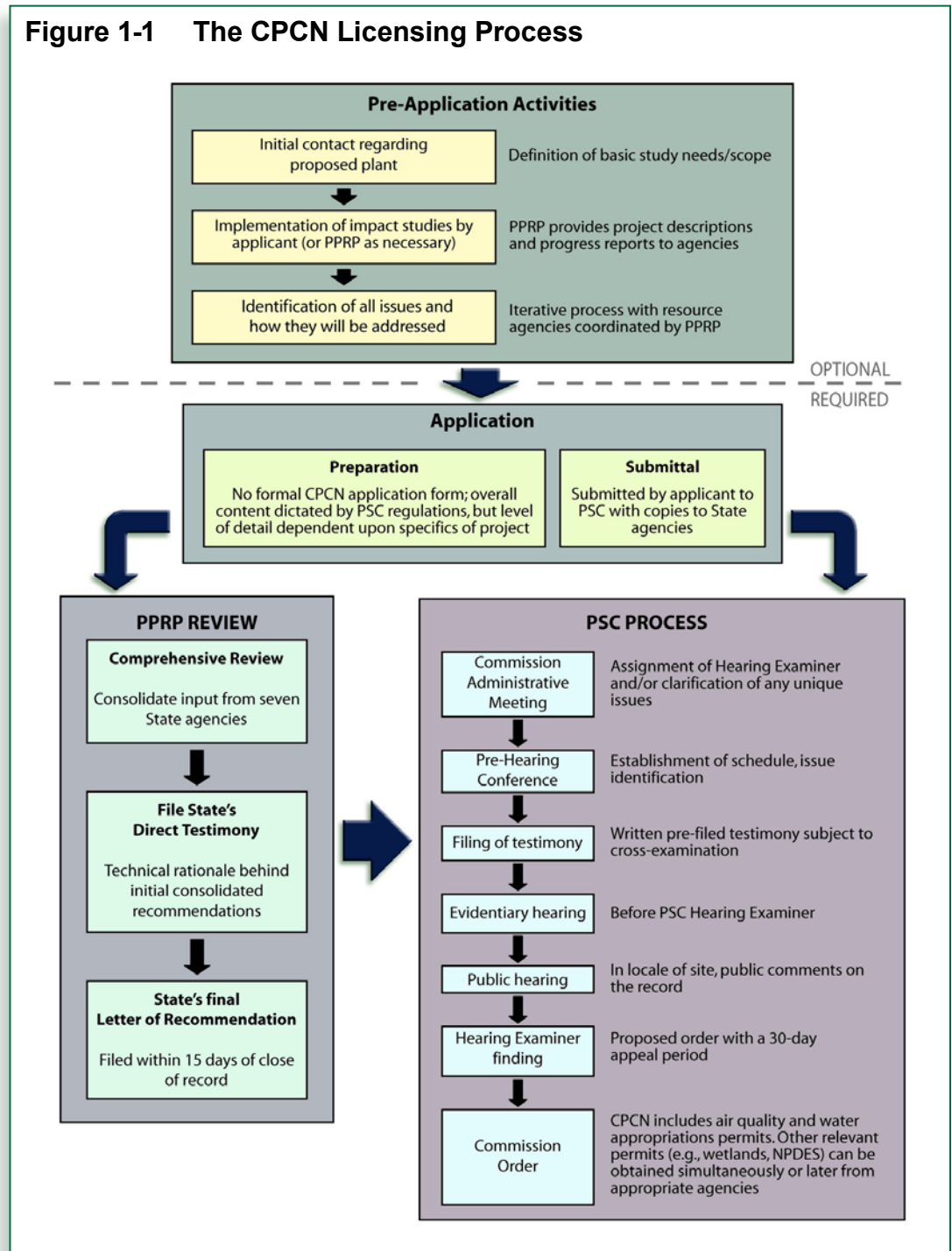
Additionally, the cumulative analysis would identify any additional licensing conditions needed to address cumulative impacts due to multiple plant applications.

Figure 1-1 illustrates the elements of the CPCN licensing process, described in more detail below.

**Pre-application.** While there are no required pre-CPCN application procedures, PPRP encourages the prospective generation or transmission applicants to meet with Program staff early and often to identify potential issues of concern and to determine whether and how all relevant concerns will be addressed. This process ensures the applicant is aware of the PSC regulations and procedures. By the time the applicant files for a CPCN, there usually has been a significant amount of dialogue and, often, the applicant has established that it is likely the proposed facility can obtain a CPCN, pending the development of recommended conditions. Through a diligent and thorough pre-application process, a prospective developer can limit the risk of submitting an unsuccessful CPCN application, or make changes during the preliminary design to minimize certain impacts.

**Application.** PSC regulations require the CPCN applicant to summarize the proposed project and its potential environmental, social, cultural, and economic impacts. The application is often accompanied by an environmental review document that presents the applicant's environmental and socioeconomic studies conducted in support of the application. Once the applicant has submitted a CPCN application to the

**Figure 1-1 The CPCN Licensing Process**



PSC, PPRP, in coordination with other state agencies, evaluates the potential impacts of the proposed project on Maryland's resources, such as water (surface and ground water), air, land, ecology, and socioeconomics, including visual impacts. In the case of transmission line projects, the need for the project is evaluated and a review of alternatives is conducted as part of the review process. The PSC schedules a hearing at which all the parties to the proceeding actively participate and file their findings as formal testimony.

**PSC Process and PPRP Review.** The PSC typically assigns a Hearing Examiner to the licensing case at a preliminary administrative meeting. The Hearing Examiner then schedules a pre-hearing conference to establish an overall procedural schedule, including dates for public hearings. The adjudicatory process commences with a discovery phase, then proceeds to the filing of direct testimony from the applicant summarizing the impact analyses that have been completed and providing the basis for the applicant's request for a CPCN. PPRP and any other parties that have intervened in the process may cross examine this testimony and present their own analyses in direct testimony. PPRP's testimony, presented on behalf of the various State agencies, typically includes initial recommended licensing conditions along with justifying analyses, which can be subject to vigorous cross examination by all parties. Other intervening parties can prepare direct testimony and present their opinions and arguments in turn, and are also subject to cross examination. The Hearing Examiner also presides over public hearings to accept comments on a project from the general public.

The Hearing Examiner takes into consideration the briefs filed by the applicant, the State, and any other parties, recommended license conditions, and public testimony, and issues a decision in the form of a proposed order on whether or not the CPCN should be granted and under what conditions. After a prescribed appeal period, a final order is released granting or denying the CPCN.

## 1.2 CEIR-15 Highlights

This CEIR provides a comprehensive overview of issues related to power plants and transmission lines in Maryland. Some of these topics have been under investigation for decades, with the scientific understanding continuing to progress. Other areas have gained prominence more recently in response to new advances in technology and economic or policy changes. Highlighted below are a few issues that are discussed in more detail within this report.

**Update on Proposed Expansion of Nuclear Power Generation Capacity.** Nuclear power generation provides abundant and reliable energy. Because nuclear power plants do not burn fossil fuels (oil, natural gas, coal) to generate electricity, they are relatively free of harmful air emissions. As part of the 2005 Energy Policy Act, the U.S. Congress created substantial financial incentives for new nuclear power development, and renewed interest in the technology has since been growing. The existing Calvert Cliffs Nuclear Power Plant in Calvert County is currently seeking licensing approval for the construction of new nuclear generating capacity. [More information on page 27]

**Investments in New Transmission Infrastructure.** Due to significant electrical load growth within Maryland and the region in general, PJM (Maryland's Regional Transmission System Operator) and electric transmission entities have indicated that the transmission and distribution system is in need of additions and reinforcements to maintain reliable service to customers. After being relatively dormant for several years, transmission line licensing activity has recently picked up, and transmission companies are currently seeking permits for major new projects. Transmission line projects can involve potential ecological

impacts associated with the loss of sensitive habitats and the crossing of streams, wetlands, and even the Chesapeake Bay, as well as potential impacts to cultural resources. [More information on page 108]

**Sustainable Energy Resources.** The use of renewable resources such as biomass, solar, wind, and hydroelectric energy continues to expand in Maryland. These types of generating technologies have generally less environmental impact than conventional power plants that burn fossil fuels, and can diversify Maryland's fuel mix. Each has its own set of potential drawbacks, including land requirements, cumulative environmental impacts, and cost. Therefore, as with any new generating facility, proposals must be carefully evaluated. The contribution of renewable energy sources to Maryland's overall generation mix is quite small; however, the State has passed legislation that would require electricity suppliers in Maryland to obtain an increasing percentage of their power from renewable sources. [More information on pages 15 and 125]

**Greenhouse Gas Initiatives.** Maryland joined RGGI in April 2007, which is a cap-and-trade-based emission reduction program. The first auction for RGGI allowances was held in September 2008, and RGGI began its first compliance period in January 2009. In addition, the 2009 Maryland legislative session passed the Greenhouse Gas Emission Reduction Act of 2009 setting aggressive goals for cutting emissions within the state. [More information on page 139]

# Key Technical Issues Addressed by PPRP 1971 - 2009

**1971**

Power Plant Siting Act was passed by the Maryland legislature in 1971 to address potential effects on the Chesapeake Bay from the Calvert Cliffs Nuclear Power Plant. PPRP was created to ensure a comprehensive, objective evaluation, based on sound science, to resolve environmental and economic issues associated with building additional power generating facilities.



**1975**

Aquatic impacts of power plants are identified due to entraining fish eggs, larvae, and/or prey organisms into their cooling systems, impinging adult and juvenile fish and crabs on intake screens, and discharging heat and chemicals into receiving waters. PPRP began testing intake designs that discourage fish congregation and determined in 1988 that impingement and entrainment can be reduced to acceptable levels, not adversely affecting aquatic biota in Maryland's surface water bodies. PPRP later evaluated methods such as barrier nets and wedge-wire screens that have become widely used for reducing impingement and entrainment levels at power plants.

**1975**

PPRP established its radioecology laboratory and initiated radiological assessment of Calvert Cliffs Nuclear Power Plant. In the aftermath of the Three Mile Island accident in 1979, the U.S. Nuclear Regulatory Commission requested PPRP's assistance in evaluating impacts to human health and the environment from radioactivity released during the event and its cleanup. The ongoing monitoring program expanded to cover Peach Bottom Atomic Power Station in Pennsylvania, just upstream from Conowingo on the Susquehanna River, in 1981. Over the past 30 years, the radioecology program has developed a valuable long-term database of radionuclide fate and transport throughout the Bay ecosystem.



**1978**

Clean Air Act Amendments of 1977 included provisions for the Prevention of Significant Deterioration (PSD) and non-attainment areas. PPRP recommended forming a policy board, establishing an offset bank exchange, and creating a multi-state planning council to share information and resolve disputes between states. On an ongoing basis, continuing with the Clean Air Act Amendments of 1990 and Maryland's Healthy Air Act of 2006, PPRP has analyzed compliance alternatives for the state's power plants and helped provide State agencies and lawmakers with technical background to support policy decisions.

1971

1975

**1984**

*Sulfur and nitrogen emissions generated by power plants were identified as a large contributor to the formation of acid rain in the Northeast and Maryland. PPRP funded significant research to determine the extent of the problem and to identify remedial actions.*

**1982**

*Coal-fired power plant operations create large quantities of solid combustion products, primarily fly ash, which need to be managed. While reuse is desired, some quantity of waste must be landfilled. PPRP conducted the first survey of CCB management methods across the state, a landmark first step in developing a thorough technical basis for evaluating, minimizing, and mitigating potential adverse impacts.*

**1985**

*Aquatic impacts such as denied access of anadromous fish to upstream spawning areas are observed at main stem Susquehanna hydroelectric dams. As the State lead, PPRP worked with Pennsylvania agencies, federal agencies, and private intervenors to address both fish passage and water quality in the federal relicensing of Conowingo and other dams on the Susquehanna. The first fish passage facility on the Susquehanna began operating in 1985. Over the subsequent 15 years, an additional stretch of more than 400 miles of the river is now open to migratory fish as a result of these settlement agreements.*



Source: Richard Clark, Exelon

**1980****1985**



#### 1992

As an outcome of PPRP's evaluation of aquatic impacts from large-volume water withdrawals at all of Maryland's power plants, BGE and PEPCO were required to conduct additional studies on long-term impacts at Calvert Cliffs, Chalk Point, Dickerson, and Wagner. In addition, PEPCO established a fish hatchery operation on the Patuxent River estuary. From 1992 to 1997, the hatchery produced 3.5 million juvenile striped bass and 750,000 shad to mitigate losses caused by the power plant's intake of cooling water. PEPCO also provided the State with \$100,000 per year for five years to fund environmental education and support projects to remove passage obstructions for anadromous fish.

#### 1997

As part of the CPCN licensing process, Panda Energy agreed to use treated effluent from the Mattawoman Wastewater Treatment Facility as a source of 1.5 million gallons per day of cooling water at its combined cycle plant in Brandywine. This approach, the first use of treated effluent for power plant cooling water in the state, conserves groundwater sources in Southern Maryland, and has helped generate operational data for other Maryland power plant proposals.

#### 1996

PPRP joined the Maryland Geological Survey and the U.S. Geological Survey in operating ground water monitoring programs to track water levels in affected aquifers over time, in response to increasing public awareness of ground water withdrawal by Maryland power plants from several coastal aquifers.



#### 1995

PPRP and MDE Bureau of Mines initiated an extensive program to address the problems of acid mine drainage as well as disposal of coal combustion by-products. The Winding Ridge project demonstrated the feasibility of using 100 percent waste products — fly ash plus by-product from sulfur dioxide removal — to seal an abandoned underground mine and minimize acidic discharges.

#### 1999

In response to water quality concerns in Maryland streams, apparently linked to agricultural runoff and the overuse of poultry litter as fertilizer, PPRP evaluated the suitability of using poultry litter as fuel. Three alternative technologies were identified that could accommodate the use of litter as a fuel: direct combustion, fluidized bed combustion, and gasification.

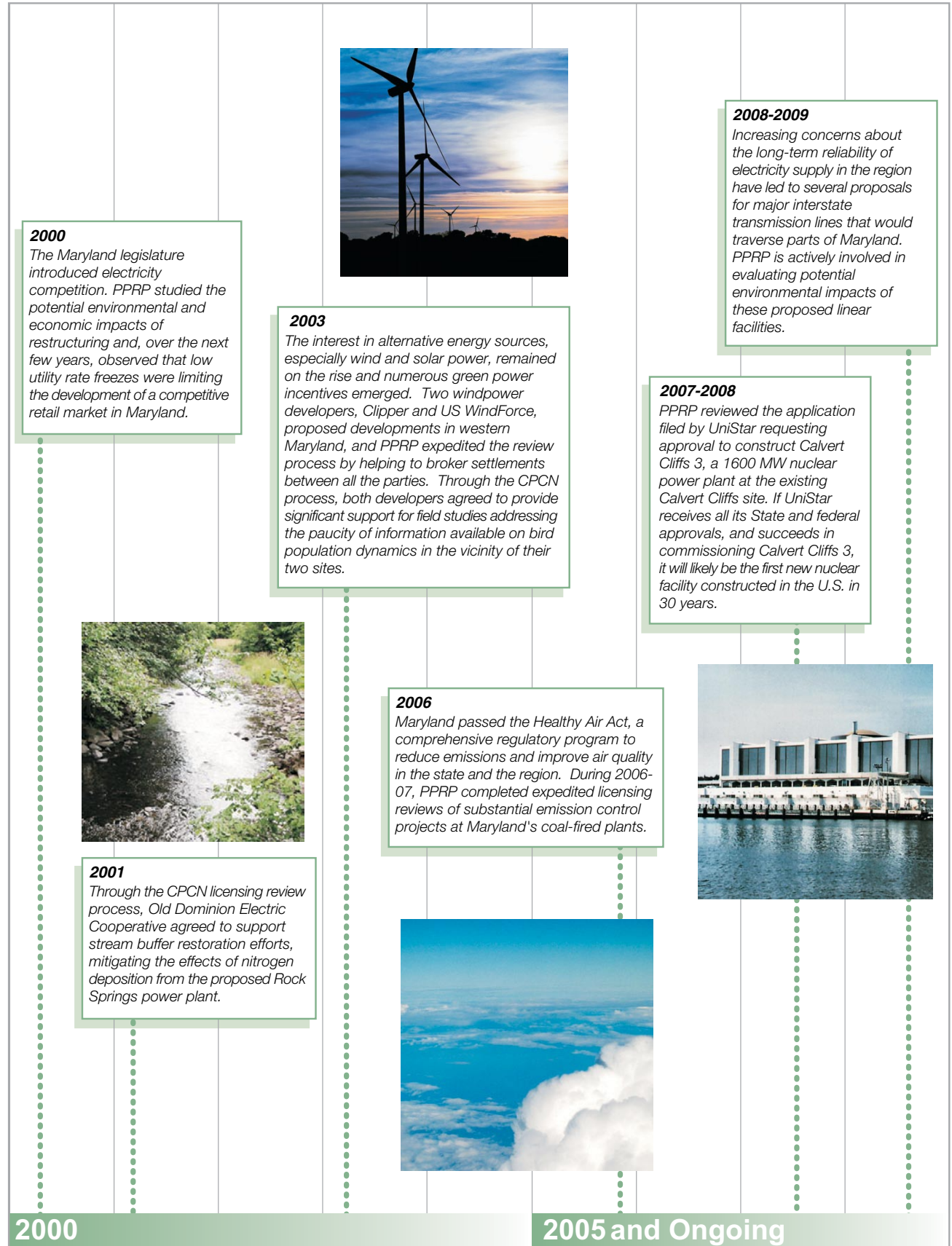
#### 1993

The effects of electromagnetic fields (EMFs) associated with generating, transmitting, distributing, and using electric power were evaluated and studies reveal conflicting results. PPRP reviewed all EMF studies and provided annual summary reports to the PSC on significant findings. Utilities constructing transmission lines have agreed to protocols for EMF measurements as well as utilization of conductor configurations resulting in the lowest EMF field strengths.



1990

1995



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